

WO 2005/019021

PCT/GB2004/003592

- 12 -

CLAIMS

[0044] 1. A buoyancy control system for controlling the buoyancy of an underwater submersible, the system comprising:-

5 a buoyancy chamber having a seawater inlet and a seawater outlet;

a power supply used to power at least one electrical component of the system; and

10 a hydraulic system for pumping seawater from the chamber through the outlet, the hydraulic system comprising a hydraulic pump and a pressure multiplier, the hydraulic pump for applying pressure to the pressure multiplier, and the pressure multiplier for increasing the pressure applied thereto by the hydraulic pump, and for applying the increased 15 pressure to seawater from the chamber to thereby pump out the seawater.

[0045] 2. A system according to claim 1 further comprising regenerative means whereby the flow of seawater passing into said inlet is converted into electrical energy for re- 20 charging a power supply.

[0046] 3. A system according to claim 2 wherein the regenerative means is configured to operate when the system is utilised to cause the vehicle to descend.

[0047] 4. A system according to claim 2 or claim 3 wherein 25 said regenerative means includes a turbine, driven by the flow of seawater, to provide an electrical output.

[0048] 5. A system according to claim 4 wherein said electrical output is processed locally by a receiver circuit configured to produce a smoothed electrical signal for 30 application to a charging circuit.

[0049] 6. A system according to claim 5 wherein said charging circuit is controlled by an electronic control system to distribute charging current to the battery.

WO 2005/019021

PCT/GB2004/003592

- 13 -

[0050] 7. A system according to any one of claims 2 to 6 wherein said regenerative means is dynamically adjusted according to the pressure differential there across during said flow of seawater.

5 [0051] 8. A system according to any preceding claim wherein the buoyancy chamber comprises a glass, steel or titanium sphere.

[0052] 9. A system according to any preceding claim wherein the buoyancy chamber can withstand pressures at undersea depths of 3000m or greater, and has a capacity to hold up to 34kg of seawater.

[0053] 10. A system according to any preceding claim wherein the pressure multiplier comprises input and output surfaces in pressure transmitting relation, the output surface having 15 a surface area less than the surface area of the input surface, the pressure increase generated by the pressure multiplier being determined by the ratio of surface areas of the input and output surfaces.

[0054] 11. A system according to claim 10 wherein the input 20 surface comprises a plate.

[0055] 12. A system according to claim 10 or 11 wherein the output surface comprises a plunger or piston.

[0056] 13. A system according to claim 12 wherein the pressure multiplier includes an output and comprises a non-25 return valve or valves associated therewith.

[0057] 14. A system according to any preceding claim further comprising:-

a flexible bag provided internally of the buoyancy chamber; and

30 expanding means for causing expansion of said flexible bag.

[0058] 15. A system according to claim 14 wherein said expanding means comprises a pressurised container for

WO 2005/019021

PCT/GB2004/003592

- 14 -

providing gas to the flexible bag.

[0059] 16. A system according to claim 15 wherein a volume of the pressurised container and the pressure of the gas therein are selected according to a mission profile of a submersible vehicle, the system of which forms a part.

[0060] 17. A system according to any preceding claim further comprising an electronic control system having means for transmitting data concerning the state of operation of the system to a home station.

10: [0061] 18. A submersible vehicle including a buoyancy control system according to any preceding claim.